Device/User Interface Software Requirements For Aydin Monitor 329A BPSK Demodulator

Version 1.0

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1.0 Introduction

This document provides device and user interface requirements for the Aydin Monitor 329A Bi-Phase Shift Keyed (BPSK) Demodulator.

2.0 Required Functionality

The BPSK demodulator is a device within the Data Handling Node. This device separates coherent or non-coherent PSK-NRZ, RZ or split phase modulated data from an FM multiplexed signal. Optimum demodulator performance at low input signal-to-noise ratio is characteristic of the Model 329A. It performs subcarrier detection and synchronous demodulation of an input PSK modulation channel contaminated by wide band noise and imbedded within a multiplex of other PSK and FM channels.

This device will be used as part of the telemetry data path from the Antenna Node on into the Data Handling Node. Output from this device will be directed to a Bit Sync This device will be connected to other devices in the telemetry signal data path by way of its signal input/output ports. This device's inputs/outputs will be switched through an Analog Matrix Switch. Moreover, the command input port of this device will be connected to its node computer through a Digiboard switchable serial port controller. The full capabilities of this device will be used.

3.0 Parameter Ranges

The needs of ground station implementation will not require parameter limits that are different than those which are standard to the device.

The Aydin Monitor 329A BPSK Demodulator has the following range and parameter limits.

- Subcarrier Frequency 500 Hz to 9.999 MHz
- Double-Sided Data Bandwidth 100 Hz to 9.900 MHz
- Loop Bandwidth 1.0 Hz to 10 kHz
- Subcarrier / Bandwidth Ratio Not to exceed 1000
- Input Selection 4 input sources, switch selectable

4.0 Communications Protocol

RS-232 Serial protocol will be used to communicate with this device. This device will be connected by way of a direct serial line. The port settings are as follows:

- Baud Rate 9600
- Stop Bits 2
- Data Bits 8
- Parity Odd.

Other port settings are as follows:

- Data-Terminal-Ready control (DTR) Disabled
- Ready-To-Send control (RTS) Disabled
- Data Set Ready sensitivity (DSR) Off.

5.0 GUI Functionality

It should be noted that a simple device reset only resets the device to the values contained in the front panel switches. These values may not readily be known by users as the device may be remotely located. It is expected that users will want to reset the device to a known state. Default values for device start-up following reset are noted.

The user will be able to set the following remote controllable features.

- Reset

  This feature will perform an immediate reset of the device to its default hard-coded values.

- Apply Now

  This feature will cause the device to be set to the settings contained in the User Interface.

- Subcarrier Frequency

  This item has a range of 500Hz to 9.999 MHz.
  This item is defaulted to *1.024 * 10 **6 Hz* upon device startup/reset.

- Band Width Frequency

  This item has a range of 100 Hz to 9.900 MHz.
  This item is defaulted to *1.2 * 10 **4 Hz* upon device startup/reset.

- Loop Band Width Frequency

  This item has a range of 1Hz to 10 kHz.
  This item is defaulted to *2.0 * 10 **2 Hz* upon device startup/reset.

- Input Source

  This item has a range of 1 to 4.
  This item is defaulted to *Source #1* upon device startup / reset.

The following items can be retrieved:

- Subcarrier Frequency
- Band Width
- Loop Band Width
- Signal Input Source

The following items are able to be monitored

- Remote / Local Status
- Signal Sync Status
- Signal Loss Status

6.0 Command Scripting

See Appendix B: Scripting Requirements

7.0 High-level Status

The following items can be used to monitor the availability of and quality of data passing through this device.

- Remote / Local Status
- Signal Is Present
- Signal Is Synced

These items will be polled at a rate of once per second.

Note that remote control users of this device only have control/access to those items contained in the six register storage block of the machine. The phase meter and the deviation meter(s) are analog concepts which are indications of varying signal condition and are not contained in the six register block. They are unavailable to remote users. Additionally, note that the vernier control is not available to remote users.

Moreover, there is no Calibrate command available to a remote user. This activity is performed automatically upon change of the subcarrier frequency while in variable oscillator mode.

Extra Special Critical Note: This device will not respond to remote control commands nor provide status if the Remote switch is not physically engaged. It will simply sit there and ignore messages from the host computer. There is no electronic/software override of this!

Moreover, front panel control of the device is **not** locked out when the remote switch is engaged. Users will still be able to alter settings of the device while in remote mode. This can not be overridden.

There are two indications of device responsiveness: 1) Receipt of the “last message accepted” (actually an ACK character) message following issue of commands, and 2) A comparison of the values currently stored in the device’s registers with the version stored currently in the host computer.

This comparison is typically done during configuration file loading and verification.

8.0 Replacement Algorithm

Note that when power is first applied or following a power interruption, this device will default to the operating parameters as defined by the front panel switches. This device will then enter the local or remote mode as defined by the front panel switch. An unattended demodulator operating in Remote mode will thus loose its parameter settings (to be replaced with the settings in the front panel switches), but will remain in Remote mode after a power interruption.

If the controlling computer drops out, i.e. looses control of this device through its own power failure or some other reason, this device will continue to function with its last settings intact. The controlling computer will be able to resume control of this device upon restart/re-initialization of the controlling computer, provided that this device was in remote mode at the time of the control loss.

Operator intervention will be required to recover from loss of the device. Present Norway Ground Station design calls for just two of these demodulator devices. Loss of the device will be indicated by a loss of responsiveness to commands, or by loss of signal presence and/or sync. This device loss will be reflected on the Master Node control screen. At this time the Master device configuration table will have to be updated

Appendix A: Graphical User Interface Requirements

There are no additional user interface requirements.

Appendix B: Scripting Requirements

Master	Node	Comments/Error Handling

Resource Request Specific
Parameter: unit number
	Start
	
	Check allocation table for unit number
	
	If available then
	Mark unit as assigned to this Master
	Reply " Unit # assigned"
	Open log file
	Retrieve configuration file from this Master
	Else
	Reply " Unit # not available"
	End
	
	Stop
		>> Insure that Remote switch is depressed
		
		>> Issue an 'Alive' and listen for a response to indicate that unit is responding and available

Resource Request General	Start
	
	Check allocation table for an available unit using the least recently used method
	
	If available then
	Mark unit as assigned to this Master
	Reply " Unit # assigned"
	Open log file
	Retrieve configuration file from this Master
	Else
	Reply " No units available"
	End
	
	Stop
		>> Insure that Remote switch is depressed
		
		>> Issue an 'Alive' and listen for a response to indicate that unit is responding and available

Setup Parameter: unit number	Start	

Master	Node	Comments/Error Handling

	Verify possession of unit by this Master
	
	If not assigned to this Master then
	Inform this Master
	Stop
	End
	
	Load and Verify configuration file
	
	If configuration file error then
	Inform this Master
	Stop
	End
	
	Stop
		>> Operator intervention required
		
		>> Operator intervention required

Start Support
Parameter: unit number
	Start
	
	Verify possession of unit by this Master
	
	If not assigned to this Master then
	Inform this Master
	Stop
	End
	
	Begin polling for signal presence and signal sync flags at a 1 pps rate.
	
	If status changes then
	Report status change
	End
	
	Stop
		>> Operator intervention required

Stop Support Parameter: unit number	Start Verify possession of unit by this Master	

Master	Node	Comments/Error Handling
	If not assigned to this Master then Inform this Master Stop End Stop	>> Operator intervention required
Takedown Parameter: unit number	Start Verify possession of unit by this Master If not assigned to this Master then Inform this Master Stop End Mark unit as not assigned Close log file Send log file to this Master Stop	>> Operator intervention required